Due at the start of class on Tues Mar 9, 2004.

Answer the following questions in groups of two or three. Turn in one solution sheet per group. Write the names of your group’s members at the top of the first page of your solution sheet.

1. If \( x^y = y^x \), use logarithmic differentiation to compute \( \frac{dy}{dx} \) at the point (3, 3).

2. This question considers derivatives of exponential functions and functions which are compositions of exponential functions. For example, the function \( f(x) = 2^x \) is NOT a polynomial, so our derivative rules for polynomials do NOT apply to \( f \).

   (a) Write \( y = 2^x \) and use logarithmic differentiation to find \( y' \).

   (b) Repeat (a) for the function \( g(x) = 3^x \).

   (c) Use the methods of (a) and (b) to find the derivative of \( b^x \) (with respect to \( x \)) where \( b \) is a positive constant.

   (d) Repeat (c) for \( (h(x))^x \) for any differentiable positive-valued function \( h \).

   (e) Repeat (d) for \( (h(x))^{m(x)} \) for any differentiable functions \( h \) and \( m \), where \( h \) is positive-valued.

   (f) Check that your formula in (e) agrees with your formula in (c) using \( m(x) = x \) and \( h(x) = b \).